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ATTACHMENT
for Work Plan OU-5 Woman Creek Priority Drainage

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Any questions please call Carlotta Muheim at 966-3893.

TITLE: Phase I Field Sampling Plan (FSP)

Approved By: [signature] 3/29/92
Name (Date)

7.0 PHASE I FIELD SAMPLING PLAN (FSP)

7.1 BACKGROUND AND SAMPLING RATIONALE

7.1.1 Background

The objectives of the Phase I RCRA Facility Investigation (RFI)/Remedial Investigation (RI) are:

- To characterize the physical and hydrogeologic setting of the Individual Hazardous Substance Sites (IHSSs).
- To assess the presence or absence of contamination at each site.
- To characterize the nature and extent of contamination at the sites, if present.
- To support the Phase I Baseline Risk Assessment (BRA) and Environmental Evaluation.

Within these broad objectives, site-specific data needs have been identified in Section 4.0. The purpose of this section of the work plan is to provide a Field Sampling Plan (FSP) that will address data needs and data quality objectives. The FSP developed in this section is based on the requirements of the Interagency Agreement (IAG) Statement of Work for OU5, and the data needs developed in Section 4.0.

In the Phase I investigation for the Original Landfill (IHSS 115), data will be collected to define contamination boundaries and investigate the potential for contaminant migration. Based on the Phase I investigation results, a Phase II source characterization investigation will be performed. If warranted, an Interim Measures/Interim Remedial Action may also be performed at IHSS 115 once Phase I results are evaluated. Additional phases of investigation and risk assessment may be required at other IHSSs pending the Phase I results, although they are not anticipated at this time.

Generally, only limited information is available concerning the IHSSs in OU5 since there have been no previous field investigations of these sites. Available information includes aerial photographs, site histories, and some analytical data for samples collected near the IHSSs. Little information exists specific to the physical characteristics of the sites or to the nature and extent of the contamination, if present.

One of the objectives of the RFI/RI is to assess the presence or absence of contamination in the groundwater, surface water, sediments, and soils at the sites. A multi-staged approach is outlined in the IAG and will be used in Phase I to achieve this objective. This technique uses an "Observational Approach" involving continuing reassessment of the site conditions as data are obtained. As data is collected and interpreted, specific sampling plans will be formulated to build on existing information. These sampling plans for subsequent stages of investigation will be submitted as Technical Memoranda (TMs) to the EPA and CDH for review prior to implementation. TMs will be used specifically for the investigation of IHSSs 115 and 133 (Original Landfill and Ash Pits) because of their complexity. They are more thoroughly discussed in the applicable sections of this FSP.

7.1.2 Sampling Rationale

As discussed above, a staged approach will be used for the sampling program. There are four stages that may be completed at any site.

- **Stage 1** consists of a review of existing data, including aerial photographs and site records. Data from ongoing or other OU investigations that have become available since preparation of this Phase I work plan will be compiled and evaluated. These data will be validated as appropriate for incorporation into the OU5 site characterization. This review of existing information has already been partially performed during preparation of this Phase I work plan.

- **Stage 2** involves screening activities, including radiation, magnetometer, electromagnetic (EM), and soil gas surveys. These activities are designed to provide Phase I screening-level data concerning the presence or absence of contaminants at some of the sites. These surveys will be conduced in the order listed. Each screening activity will be preformed after review of the previous screening method.

- **Stage 3** consists of Phase I sampling activities for soil, sediment, and surface water. Soil borings will be completed at some IHSSs to collect samples at depth and to characterize the IHSS. Some of the sampling locations may be selected to investigate anomalies identified in the Stage 2 screening surveys. This stage will provide confirmation of the Phase I screening data as well as aid in Phase I geologic and hydrogeologic characterization of the sites.

- **Stage 4** involves cone penetrometer surveys, monitoring well installation, and groundwater sampling. Cone penetrometers will be used to characterize subsurface lithology, to help locate vadose zone water or groundwater, and to help guide installation of monitoring wells. If pore pressure in the vadose zone indicates the presence of water, a BAT sampler (or equivalent) will be inserted to take a sample. Groundwater monitoring wells will be installed to characterize the hydrogeologic setting of each site and to monitor alluvial groundwater conditions within or downgradient of several sites. These wells will be sampled after completion and development, and the results will be included in the Phase I RFI/RI Report.

- **Stage 5** consists of additional sampling or surveying activities unique to each IHSS.

7.1.3 Modifications to the IAG Plan

Several sampling and analytical activities described in the IAG have been modified in this FSP. These modifications, listed below, have been made so that each IHSS can be better evaluated during the Phase I investigation. Modifications to the Phase I sampling program are presented first followed by modifications to the Phase I analytical program.

Phase I Sampling Program Modifications

1) Radiation surveys and limited soil sampling, including surface soil samples and soil borings, will be conducted at the three Surface Disturbance areas: the IHSS 209, the Surface Disturbance south of Ash Pits and the Surface Disturbance west of IHSS 209. The purpose of these activities is to assess the presence or absence of contaminants at these sites. The rationale for this sampling is that if contamination is not found, the surface disturbances can be removed from further phases of the RFI/RI process.

2) An investigation of a second surface disturbance (south of the Ash Pits) has been added to the Phase I investigation. This is an area where unknown activities have taken place at excavation and fill areas. The investigation of this area will include a review of the aerial photos, a radiation survey, surface soil sampling, and 11 soil borings. Details of this program are contained in Subsection 7.2.4.

3) An investigation of a third surface disturbance west of IHSS 209 has been added to the Phase I investigation. The investigation of this area, which appears to have been a radio tower installation, will include a review of the aerial photos, a radiation survey, and surface soil sampling and soil borings. Details of this program are contained in Subsection 7.2.4.

4) No FIDLER radiation survey will be conducted at the Original Landfill (IHSS 115). This survey has been deleted from the Phase I investigation because a more comprehensive gamma radiation survey using a germanium detector was completed in the fall of 1990. Known radiation anomalies are discussed in Subsection 7.2.1. In addition, a gamma radiation survey using a germanium detector will be used at the Ash Pits (IHSS 133) instead of the radiation surveys specified in the IAG.

5) Two-foot composite samples will not be used for volatile organics analysis at the Original Landfill (IHSS 115). Instead, discrete samples will be collected at 2-foot increments for analysis. Composite samples are not appropriate for analysis of volatile organic compounds, since a significant portion of the volatiles present in a sample can be volatilized during compositing of a sample.

6) Five sediment samples are to be collected from both Ponds C-1 and C-2 (IHSSs 142.10 and 142.11), as proposed in the IAG. However, three of the five locations have been changed so that more representative samples of the pond sediment can be obtained. The five locations proposed in this Phase I FSP are:

- In the deepest portion of the pond.
- In the pond, 5 feet from the inlet.
- At three randomly selected locations within the pond.

The samples to be collected at the three random locations are the locations which have been changed from those specified in the IAG. These random samples will provide pond sediment data that can be statistically averaged, while the samples collected from the deepest part of the ponds are likely to provide worst case concentrations. These average and worst case concentrations can then be used to better characterize the extent and nature of any contamination in the ponds and provide more useful data for the Phase I BRA. The three original sampling locations specified in the IAG would provide non-random data that cannot be used in statistical analyses.

7) Sediment samples from Woman Creek and the South Interceptor Ditch (SID) will be collected to characterize the drainage where existing data is currently lacking. These samples will be placed just downstream of the impact area (area where surface runoff from an IHSS reaches Woman Creek) for each IHSS along Woman Creek and along stream segments that need further characterization. Based on a review of the data collected at the existing 18 sediment sample locations, there exists a significant amount of information about the sediment in many parts of the OU5 drainages (see Section 2.0). Based on this approach, two additional sampling locations have been placed downstream of the Ash Pits, four downstream of the Old Landfill, one between the Old Landfill and Pond C-1, one between Ponds C-1 and C-2, and four downgradient of Pond C-2. These 12 proposed sampling locations in combination with the existing 18 sampling locations should be sufficient to characterize the Woman Creek and SID sediment.

The IAG states that all sediment samples will represent the entire vertical column of sediment present at each location, and if the sediment depth is greater than 2 feet, individual 2-foot composites will be collected. This technique could potentially dilute any surficial contamination. Instead, the top 2 inches of bed material will be collected for VOC analysis and 6-inch core will be collected for analysis of all other parameters. Standard Operating Procedure (SOP) SW.6 will be followed for sediment sampling. This SOP is presented in Section 11.0.

8) Eight borings will be drilled and sampled in the Original Landfill (IHSS 115) area. One boring will be drilled at the location of each of the two former ponds and six borings will be drilled in the disturbed area east of the landfill. The borings will be drilled 6 feet into weathered bedrock.

Samples will be analyzed for the same constituents as other soil samples from the landfill (as presented in Table 7-1). There have been no previous investigations in either the areas of the former ponds or the disturbance east of the landfill. These borings will provide Phase I data concerning the presence or absence of contamination at these locations.

9) One additional well will be installed downgradient of the Old Landfill (IHSS 115). The well will be located between existing wells 5786 and 7086 south of the SID. The well will be completed in the alluvial materials.

10) A magnetometer survey and an EM geophysical survey will be conducted at the Old Landfill (IHSS 115) and Ash Pits (IHSS 133). In addition, two cone penetrometer surveys will be performed downgradient of the Original Landfill. The magnetometer surveys will be used to evaluate the presence of ferrous materials in the units. The EM survey will determine differences in the conductivity of subsurface materials, which may allow evaluation of the IHSS boundaries, presence of contamination, and/or the presence of saturated material. The cone penetrometer will be used to identify saturated subsurface material for subsequent soil water sampling between the landfill and the SID, and between the SID and Woman Creek. The information gathered from the cone penetrometer will be used to define the best locations and depths for groundwater monitoring wells or if appropriate, vadose zone sampling using the BAT sampler.

11) Soil borings were initially proposed in the IAG to delineate the boundaries of the Ash Pits, Incinerator and Wash Pad (IHSS 133). Borings were proposed to be placed on 25-foot centers that transect each site. If the boundaries of IHSS 133 can be determined by aerial photography review, radiation survey and/or the proposed geophysical surveys, fewer soil borings will be necessary. The purpose of these borings would be to characterize the contamination sources at IHSS 133. The number of location of borings will be addressed in a TM.

12) Surface soil sampling for plutonium and other radionuclides may be preformed at the Rocky Flats Plant site between Woman Creek and the southern boundary pending further data evaluation. This is discussed in Subsection 7.2.4.1. Sediment and surface water sampling in this area is also discussed in this section.

Phase I Analytical Program Modifications

1) All the Phase I soil samples collected from the Ash Pits area (IHSSs 133.1-133.6) will be analyzed for target analyte list (TAL) metals as well as for uranium, plutonium, americium, gross alpha, and gross beta. This should provide a more representative analysis of the wastes thought to be present in these pits. This is also appropriate, since the groundwater monitoring program calls for analysis of metals in wells downgradient of this IHSS. Details of this analytical program are summarized in Subsection 7.3.2.

TABLE 7-1

PHASE I INVESTIGATION
IHSS 115 - ORIGINAL LANDFILL

Activity	Purpose	Location	Sample Number
Stage 1			
1. Review Aerial Photographs	Identify extent of the Original Landfill and disturbed area east of Landfill	Landfill area and eastward	NA
2. Review Gamma Radiation (RAD) Survey	Identify areas of anomalous radiation readings	Landfill area	NA
Stage 2			
3. Magnetometer Survey	Locate ferrous objects	Entire landfill area - 25-ft. grid	2,490
4. EM Survey	Locate ferrous objects, and help locate IHSS boundaries	Entire landfill area - 25-ft. grid	2,490
5. Soil Gas Survey	Locate plumes of volatile organics	Entire landfill area - 100-ft. grid Modified at perimeter to 25-ft. grid	To be determined
Stage 3			
6. Surficial Soil Samples	Characterize surface contamination; characterize RAD survey anomalies	Random basis throughout landfill and within RAD survey anomalies	To be determined statistically; 2 samples per RAD survey anomaly
7. Soil Cores	Verify soil gas survey readings (false negatives)	One random sample every 15 soil gas samples taken at the depth of the soil gas probe	To be determined
8. Soil Borings	Characterize subsurface conditions and contamination	One boring in each area of the two former ponds, six in the disturbed area east of the landfill	8
9. Soil Borings, if plumes identified	Transect and sample plumes, if identified by soil gas survey	Three borings transecting each plume, one boring at highest soil gas reading and two additional borings downgradient of the first.	To be determined
10. Sample sediment and surface water	Characterize sediment and surface water downgradient of landfill	Two locations along SID and three locations on Woman Creek	4 sediment and 6 surface water
Stage 4			
11. Cone Penetrometer/Sampler	Characterize subsurface conditions and lithologies; characterize subsurface fluids and/or gases	Two lines on 100 ft. spacing downgradient of landfill	To be determined

TABLE 7-1

PHASE I INVESTIGATION
IHSS 115 - ORIGINAL LANDFILL
(Continued)

Activity	Purpose	Location	Sample Number
12. Install wells in borings, if plumes identified	Monitor subsurface plumes, if identified	In borings at the points of highest readings	Maximum of 3
13. Install wells and/or vadose zone sampling devices	Monitor subsurface conditions	To be determined based on data collected	To be determined
Stage 5			
14. Review plant plans, conduct sewer snake survey	Confirm connections of two pipes daylighting in the landfill	Two pipes in landfill	NA
15. Sample pipe effluent if following	Characterize effluent	Pipe outfalls	2

NA - Not Applicable

2) A gamma radiation scan will be conducted by EG&G or its contractor on each of the sediment samples collected from the location at the deepest portion of Ponds C-1 and C-2 (IHSSs 142.10 and 142.11). Sediment samples at these locations will be collected from the sediment core at 5-centimeter intervals. The rationale behind including this analysis is to evaluate whether contamination may exist in thinly stratified layers and to provide additional data to characterize pond sediment.

3) The IAG specifies that water and sediment samples be analyzed for soluble and insoluble radionuclides and metals. For the purposes of this Phase I investigation, each of the water samples will be filtered, and both the filtered and an unfiltered aliquot will be analyzed for the specified metals and radionuclides. The filtered sample will provide data on the dissolved constituents and the unfiltered sample will provide data on the total constituent concentrations. Also, water (both filtered and unfiltered) and sediments will be analyzed for both plutonium isotopes (Pu-239 and Pu-240). This is consistent with the existing Rocky Flats analytical methods.

4) Several analyses have been added to the Phase I analytical program to address chemicals of interest in the Environmental Evaluation. Borehole samples at the Original Landfill (IHSS 115) and some of the surface water and sediment samples collected in Woman Creek will be analyzed for target compound list (TCL) pesticides/polychlorinated biphenyls (PCBs). All surface (0-2 inches) soil samples taken in OU5, and sediment samples collected in Woman Creek will be analyzed for total organic carbon (TOC).

5) The two sediment samples downgradient of the Ash Pits will not be analyzed for TCL volatiles and semi-volatiles. These organic compounds are unlikely to be present in the ash disposed of in these IHSSs and organics have not been detected in the data collected from existing sediment locations in and adjacent to Woman Creek near the Ash Pits. Radionuclides and TAL metals are the suspected contaminants at the Ash Pits and the sediment analytical program downgradient of these areas will focus on these analytes.

7.2 PHASE I INVESTIGATION PROGRAM

This section describes the Phase I investigation program for the IHSSs within OU5. For each IHSS, the tasks listed are generally divided into office activities prior to field sampling (Stage 1), field screening activities prior to sampling (Stage 2), field sampling activities (Stage 3), and groundwater monitoring well installation and sampling (Stage 4). As part of the field sampling program, data from site-wide monitoring programs and investigations at other OUs will be used as appropriate to add to, or substitute for, the data collected during the Phase I investigation. The sites included within OU5 are IHSS 115 - Original Landfill; IHSS 133 - Ash Pits 1-4, the Incinerator, and the Concrete Wash Pad; IHSS 142.10 and 142.11 - C-Series Detention Ponds, and IHSS 209 - Surface Disturbance southeast of Building 881 and

two additional surface disturbances; these are the surface disturbance west of IHSS 209 and the surface disturbances south of the Ash Pits. The area south of OU5 to the property boundary will be investigated, if warranted. For reference, the Phase I investigation programs for each IHSS are summarized below. A number of SOPs will be used during the investigation. The SOPs are cited in this section and discussed further in Section 11.0 of this Phase I work plan.

7.2.1 IHSS 115 - Original Landfill

Stage 1 - Review Aerial Photographs and Gamma Radiation Survey Results

Aerial photographs taken during operation of the Original Landfill will be reviewed to identify the extent of the Original Landfill and the disturbed area located to the east of the Original Landfill. The areas to be studied during later steps of this investigation, including the location of former ponds, will be delineated from the aerial photographs and surveyed in on the ground as needed to define their locations for the Phase I field work. Additional studies conducted at the Landfill after preparation of this Phase I work plan will be evaluated during Stage 1 (see Table 7-1). Also as part of this stage, the gamma radiation survey conducted at the Original Landfill in Fall 1990, using a germanium detector (Appendix B) will be further reviewed, and the elevated radiation readings shown on Figure 7-1 will be surveyed on the ground to define their locations.

Stage 2 - Magnetometer, EM, and Soil Gas Surveys

A magnetometer survey will be performed over and downgradient of the Old Landfill and the disturbed area to the east (Figure 7-1). This survey will be conducted on a 25-foot grid in the area outlined for the radiation survey in Figure 7-1. The survey will be completed according to the magnetic locator procedure in SOP GT.10. Resulting anomalies will be mapped and contoured.

An EM geophysical survey will be performed over the Old Landfill on the same 25-foot grid established for the magnetometer survey and will cover the same area. The survey will be completed according to the EM geophysical procedures in SOP GT.18. Details of both the magnetometer and EM geophysical survey will be supplied to the Agencies for review in a TM. The TM will include the type of geophysical surveys to be performed, procedures, and grid spacing.

A real-time soil gas survey will be conducted over the Original Landfill and the disturbed area located to the east of the Landfill (Figure 7-1) to identify areas of volatile organic contamination. As specified in the IAG, the soil gas samples will be taken on a 100-foot grid according to the procedures described in SOP GT.9. To further improve the sampling coverage, the grid will be reduced to 25-foot spacing at the downgradient perimeter of the landfill, over areas of suspected buried metallic materials based on the magnetometer and EM survey, and over areas where volatiles are found during the 100-foot grid soil gas survey. The perimeter of the landfill will be defined by the aerial photograph interpretation, radiation,

magnetometer, and EM survey review, and by field reconnaissance. The 25-foot soil gas grid spacing around the downgradient perimeter will cover at least the area between the last 100-foot grid location within the landfill area and the first 100-foot grid location outside the landfill area (see Figure 7-1). The 25-foot soil gas grid located over metallic materials or volatile plumes will continue for at least 50 feet beyond the edge of the anomaly. This approach should better characterize the area of likely contamination. A probe will be driven approximately 5 feet into the soil to collect the soil gas. The soil gas samples will be analyzed for 1,1,1-trichloroethane (TCA), dichloromethane, benzene, carbon tetrachloride, tetrachloroethene (PCE), and trichloroethene (TCE) using a portable gas chromatograph (GC). Analytical peaks of compounds for which the GC is not calibrated will be noted. It will not be possible to analyze for solvent breakdown products like 1,2-dichloroethane and vinyl chloride with a GC because they co-elute with other compounds. Vinyl chloride co-elutes with freon compounds, and 1,2-dichloroethane co-elutes with methyl ethyl ketone and dibromomethane. The analytical program for the soil gas survey is discussed in Subsection 7.3.2. Details of the proposed soil gas surveying grid will be presented to the Agencies for review in a TM.

Stage 3 - Surface Soil, Soil Core, Soil Boring, Sediment, and Surface Water Samples

Randomly located surficial soil samples will be collected to characterize the landfill cover material and exposed fill material using the Rocky Flats method. Depending upon the results of the radiation screening, additional surface soil samples may be required at identified areas with above background radiation. These samples will help establish whether the landfill is leaking via fugitive dust entrained in air for risk assessment purposes. In addition, based on the review of the gamma radiation survey, additional surficial soil samples will be collected within the areas that have above background radiation. At least two samples will be collected at small or point sources of radiation and at least three will be collected over disturbed areas. A TM will be submitted to the Agencies for review prior to implementation that will specify the exact number of samples necessary for the risk assessment, and identify the sampling locations and sampling method protocol.

Soil cores will be collected on a random basis to verify the soil gas survey and other screening methods (e.g., false negative). One soil core (grab sample) will be collected for every 15 to 20 soil gas samples at the same depth as the soil gas samples. Based on the number of original grid soil gas sampling locations, it is estimated that four soil cores will be collected.

Three soil borings will be placed at up to three areas where plumes have been identified by the soil gas survey. This will result in a maximum of nine soil borings being drilled at the three plume areas. At each plume area, one soil boring will be placed at the point of the highest soil gas reading, and two borings will be located downslope of that point within the plume identified by the soil gas survey.

Soil borings will also be drilled for subsurface characterization purposes. One soil boring will be drilled in the location of each of the two former ponds. Six soil borings will be drilled in the disturbed area east of the landfill. Each soil boring will be drilled at least 6 feet below the base of the alluvial material

according to the procedures described in SOP GT.2. Samples will be taken continuously in these borings. Discrete samples will be collected from every 2-foot increment and analyzed for the TCL volatile organic compounds (VOCs). Samples will be composited from every 6-foot interval and analyzed for the TCL semivolatile organic compounds, the TAL metals, and radionuclides. As specified in the SOP, samples will not be collected for chemical analysis from the saturated alluvium. The analytical program for those samples is presented in Subsection 7.3.

During sampling a soil classification survey will be completed at the Original Landfill for use in the Environmental Evaluation. Several samples may also be collected from 0 to 2 feet for grain size analysis.

The sediments and surface water of the SID and Woman Creek will be sampled immediately downgradient of the Original Landfill. These locations are shown in Figure 7-2, which is a map of all the proposed surface water and sediment sampling locations for OU5. Surface water samples will be collected at three locations along the SID and three locations on Woman Creek (total of six samples) according to the procedures specified in SOPs SW.2 and SW.3 for surface water. Sediment samples will be collected at two locations along the SID and two locations on Woman Creek (total of four samples) according to procedures specified in SOP SW.6 (see Subsection 7.2.3). The sediment samples will be collected in areas of the creek or ditch that are conducive to sediment accumulation. The analyses to be performed on these samples are listed in Subsection 7.3.

Stage 4 – Cone Penetrometer, BAT Sampler (or equivalent), Monitoring Well Installation and Groundwater Sampling

A cone penetrometer will be used to establish subsurface conditions and lithologies downgradient from the landfill. One subsurface condition that is essential to characterize is soil moisture and/or saturation. A cone penetrometer with this capability will be used. Two lines of cone penetrometer surveys will be taken with a maximum of 100-foot spacing between penetrometers; one line will be between the Landfill and the SID, and one line between the SID and Woman Creek (see Figure 7-1). In the appropriate cone penetrometer survey locations (locations where significant soil moisture is present), BAT sampling, or an equivalent, will be used to sample any encountered groundwater or interstitial fluid. These samples are necessary to help establish whether contaminated plumes are presently leaking from the landfill. To calibrate the cone penetrometer, one of the soil borings discussed above will be "twinned" so that the cone penetrometer will penetrate known lithologies and saturations. A TM will be submitted to the Agencies for review outlining the details of the cone penetrometer use, type of sampler, spacing and analyte list.

Based on information from the magnometer, EM, and soil gas surveys, and cone penetrometer data, the location for alluvial monitoring wells will be determined. Final locations for the monitor wells will be submitted to the Agencies for review in a TM. It is possible due to the limited saturated thickness of the alluvium, that there may be locations where there is no water or times of the year when the saturated

Figure 7-2 (cont.)

thickness is zero. If this is the case, it may be necessary to relocate the wells or possibly install a vadose zone sampling device such as the BAT sampler (or an equivalent) capable of characterizing the contaminant plumes in zones of limited water. It may also be necessary to install bedrock wells beneath zones of contaminated alluvial groundwater or if a subcropping sandstone is encountered. The need for bedrock wells will be evaluated after lithologic and preliminary chemistry data has been gathered and interpreted. At this time it is proposed that a maximum of three monitoring wells will be installed in these borings. As specified in the IAG, all of these wells will be installed in the alluvium just above the bedrock according to SOP GT.6.

In addition to the above wells, four alluvial monitoring wells and/or vadose zone samplers will be installed in the alluvium downgradient of the Original Landfill. The location, type, and number of monitoring devices will be dependent upon the results of all other data gathered in this Phase I investigation. At this time, it appears at least three wells should be installed between the Landfill and the SID, and one well installed between the SID and Woman Creek: locations shown on Figure 7-1 are tentative. The first well will be placed approximately between the western leg of the Landfill and the SID. The second well will be placed in the alluvium in the surface drainage north of Well 5786 between the Landfill and the SID within the area of the old embankment. The third well will be placed in the alluvium between the southeastern corner of the boundary of IHSS 115 and the SID, downgradient of the outfall identified on the east side of the Landfill. The fourth well will be placed between existing wells 5786 and 7086. These locations may be modified slightly depending upon the results of the screening surveys. If a water-bearing sandstone unit is found to be the first bedrock unit underlying the alluvium in a boring, then an additional well will be completed in the sandstone at that location. The use and location of the proper type of monitoring device should be able to ascertain both present and future contaminant levels and help establish any future or present contaminant migration problems. The locations for the monitoring devices should allow for monitoring the principal groundwater and downgradient migration pathways of the Old Landfill.

All groundwater monitoring wells will be drilled according to SOP GT.2 and installed according to SOP GT.6. All wells will be developed according to SOP GW.2. Following development, wells will be sampled according to SOPs GW.5 and GW.6. The analyses to be performed on these samples are listed in Subsection 7.3. The results of the first round of sampling will be reported in the Phase I RI Report. The four monitoring wells downgradient of the Landfill will be sampled quarterly for a minimum 1 year.

Stage 5 – Outfall Pipe Location, Source, and Sampling

The two corrugated metal pipes protruding from the Landfill (Figure 7-1) will also be investigated in this FSP. Plant plans will be reviewed and a sewer snake survey will be conducted to attempt to identify the open length of the pipes and the sources of water. This survey may use a traceable electronic or magnetic source attached to the snake such that surface instruments can be used to follow the path of the pipe. Other methods for locating pipes may also be used if the sewer snake survey is

inconclusive. If water is found to be flowing through either of the corrugated pipes during this Phase I investigation, the effluent will be sampled according to SOP SW.3. Results of the sampling will be reported in the Phase I RI Report.

7.2.2 IHSS 133 - Ash Pits 1-4, Incinerator, and Concrete Wash Pad

Stage 1 – Review Aerial Photographs

Aerial photographs from 1953, 1955, 1964, 1969, and 1978 through 1988 will be reviewed to identify the extent of the disposal areas for these sites including an area north of the west access road and possible waste disposal areas beyond the boundaries of Ash Pit 1 and the Concrete Wash Pad (see Section 2.0). The dimensions of each pit, determined from the aerial photographs, will be land surveyed in and used to assist in planning the Phase I drilling program and for defining the area of the radiation survey (see Figure 7-2 and Table 7-2).

Stage 2 – Radiation, Magnetometer and EM Geophysical Surveys

A ground based radiation survey employing a high purity germanium gamma-ray sensor will be performed over the four Ash Pits, the Concrete Wash Pad, and the Incinerator. The area to be surveyed for IHSS 133 is shown on Figure 7-2 and extends from the western boundary of the previously surveyed area over the Original Landfill (Appendix B) to approximately 600 feet west of the Concrete Wash Pad. The sodium iodide sensors employed for this survey will be spaced such that there is overlapping coverage between stations to guarantee that there is 100% coverage. The gamma emitting radionuclides that are detected will be analyzed to identify the isotopes that may be present. An SOP is currently being developed for performing this survey. If areas of anomalous radiation readings are detected, they will be surveyed and staked sufficiently to define their lateral extent. The results will be plotted and contoured on a map and will also be presented in tabular form.

Using the Observational Approach, a magnetometer and an EM geophysical survey may be performed over the Ash Pits in the same area as outlined for the radiation survey on Figure 7-2 to help locate the boundaries of each IHSS. These surveys will be performed if the results of the previous activities fail to outline the locations of the Ash Pits 1-4, Incinerator, and Concrete Wash Pad. These surveys would be conducted on a 25-foot grid according to the magnetic locator procedure described in SOP GT.10 and according to the EM geophysical procedure described in SOP GT.18. Resulting anomalies would be mapped and contoured. Prior to implementation, the need for, and as appropriate, the details of the magnetometer and EM surveys will be presented to the Agencies for review in a TM. Type of instrumentation, grid spacing, operating procedures, and justification for use or non-use will be included.

TABLE 7-2

PHASE I INVESTIGATION
IHSS 133 - ASH PITS 1-4, INCINERATOR, AND CONCRETE WASH PAD

Activity	Purpose	Location	Sample Number
Stage 1			
1. Review Aerial Photographs	Identify extent of the areas, including areas beyond the boundaries of the units	Entire site and north of road	NA
Stage 2			
2. Radiation Survey	Locate areas of anomalous radiation readings	IHSS areas, areas between pits, and area between Ash Pits and Landfill	NA
3. Magnetometer Survey	Locate metallic objects	IHSS areas, areas between pits, and area between Ash Pits and Landfill	4,864
4. EM Survey	Locate metallic objects and contaminant plumes	IHSS areas, areas between pits, and area between Ash Pits and Landfill	4,864
Stage 3			
5. Surface Soil Sampling	Characterize radiation anomalies	Central location of areas of radiation above background	Unknown
6. Soil borings	Characterize subsurface conditions and contamination	Within pits and over hotspots. Borings will be drilled 5 ft. into weathered bedrock.	To be determined
Stage 4			
7. Install wells	Monitor alluvial groundwater downgradient of the unit	See Figure 7-3	3

NA - Not Applicable

Stage 3 – Surface Soil Sampling and Soil Borings

Surficial soil samples will be collected from random locations to characterize any contamination in surface soils that may have resulted from operation of the incinerator. In addition, surface soil samples will be collected for radiochemical analysis at the central location of all areas identified by the radiation survey as having above-background radiation levels. These soil samples will be used to characterize migration pathways for surface contaminants in the risk assessment. Samples will be collected according to the sampling procedures specified in SOP GT.8. A TM will be issued to the Agencies for review prior to implementation that specifies the number of samples, sampling locations and operating procedures that meet the objectives for the risk assessment.

Soil borings will be drilled during the Phase I investigation to characterize cover and subsurface materials. Soil borings are stipulated in the IAG to delineate the boundaries of the Ash Pits, Incinerator and Wash Pad. Borings were to be placed along the short axis of each pit. Based on the present size of the Ash Pits, Incinerator, and Wash Pad, it was estimated that approximately 85 borings on 25-foot centers would be drilled in the area. Using aerial photo interpretation and the results of the magnetometer and EM surveys, if necessary, the number of soil borings needed may be significantly reduced to characterize the subsurface material. The soil boring program will be presented to the Agencies for review in a TM prior to implementation. Soil borings will also transect each area of anomalous radiation readings detected during the radiation survey. At this time, it is proposed that each boring be drilled 5 feet into weathered bedrock and be drilled and sampled according to procedures contained in SOP GT.2. Samples would be taken continuously in these borings. Samples would be composited from every 2-foot interval and analyzed for metals, total uranium, plutonium, americium, chromium, gross alpha, and gross beta (see Subsection 7.3).

During sampling, a soil classification survey will be completed at the Ash Pits for use in the Environmental Evaluation. Several samples may also be collected form 0 to 2 feet for grain size analysis.

Stage 4 – Monitoring Well Installation, BAT Sampler (or equivalent) and Groundwater Sampling

A maximum of three alluvial monitoring wells will be installed downgradient of the Ash Pits between IHSS 133 and Woman Creek: preliminary locations are shown on Figure 7-3. The actual location, number and type of monitoring wells will be selected following the Stage 3 activities and after a review of the geologic characteristics of the site. This groundwater monitoring plan will be summarized in a TM, and submitted to the Agencies prior to implementation. Any wells that are proposed will be drilled according to SOP GT.2, installed according to SOP GT.6, and developed according to SOP GW.2. Following development, the wells will be sampled according to SOP GW.5 and GW.6. The wells will be screened to monitor the saturated section of the alluvium. If a water-bearing sandstone unit is found to be the first bedrock unit underlying the alluvium in a boring, an additional well will be completed in the sandstone unit at that location. It is possible, due to the limited saturated thickness of the alluvium,

that there may be locations where there is no water or times of the year when the saturated thickness is zero. If this is the case, it may be necessary to relocate the wells or possibly install a vadose zone sampling device such as the BAT sampler (or an equivalent) capable of characterizing the contaminant plumes in zones of limited water. The proper use and location of the monitoring devices should allow evaluation of groundwater contamination and contaminant migration. The need for bedrock wells will be evaluated after lithologic and preliminary contaminant data has been gathered and interpreted. The Phase I analytical program for samples collected from these wells is presented in Subsection 7.3. The results of the first round of sampling will be reported in the Phase I RI Report. The wells will be sampled quarterly for a minimum of 1 year.

7.2.3 IHSS - 142.10-11 - C-Series Detention Ponds

Stage 1 – Review of Existing Data

Surface water and sediment samples are currently being collected at locations in the Woman Creek drainage as part of ongoing monitoring activities at the Rocky Flats Plant. The sampling locations, methodology, analytical parameters, and results from this monitoring will be reviewed prior to the Phase I field investigation to assess the potential overlap between the programs. Data collected during the ongoing monitoring may satisfy the requirements of this OU5 program and will be utilized, if appropriate. Also, as specified in the IAG, the 1986 report "Trends in the Rocky Flats Surface Water Monitoring" (U.S. DOE 1986a) and other data pertaining to these ponds will be submitted to the EPA and the CDH.

Stage 2 – Surveys

No survey activities are proposed for this IHSS.

Stage 3 – Surface Water and Sediment Samples Collected in the C-Ponds, Woman Creek, and the SID

Five surface water samples will be collected from each of the two C-Series Detention Ponds (Table 7-3). At least one of the five water samples at each pond will be taken from the deepest part of the pond. As specified in the IAG, during the collection of this sample, the presence of stratification in the pond water will be evaluated. Stratification of the water column will be identified through temperature and/or dissolved oxygen measurements taken according to SOP SW.8. If stratification of the pond is identified at this location, grab water samples will be taken from each vertically stratified zone. The second surface water sample from each pond will be collected within 5 feet of the inlet to the pond. The third surface water sample for each pond will be collected within 5 feet of the pond spillway. The two remaining sample locations will be selected at random based on the size of the pond at the time of sample collection. The surface water sample collected at each location will consist of a composite sample from the entire vertical water column, except for the grab samples at the deepest sampling location (described above). Samples will be collected according to SOPs SW.1, SW.2, and SW.8 as

TABLE 7-3

PHASE I INVESTIGATION
IHSS 142.10-11 - C-SERIES DETENTION PONDS

Activity	Purpose	Location	Sample Number
Stage 1			
1. Review Existing Data	Determine usefulness of existing surface water and sediment samples	C-Ponds, Woman Creek and the SID	NA
Stage 2			
No Activity			
Stage 3			
2. Collect surface water samples	Characterize surface water contamination	5 locations in each pond and from each vertically stratified zone at the deepest point in the pond	16
3. Collect sediment samples in ponds	Characterize sediments in ponds and contamination	5 locations in each pond. Samples will also be taken from each 5-centimeter interval of sediment from the deepest part of each pond.	10
4. Collect sediment samples in other locations on Woman Creek	Characterize Woman Creek sediments and contamination	See Figure 7-2 and text	10
5. Collect sediment samples in the SID	Characterize SID sediments and contamination	See Figure 7-2 and text	2
Stage 4			
6. Install wells	Monitor alluvial groundwater downgradient of the ponds	Below ponds C-1 and C-2 dams (2 each)	4

NA = Not available

they apply to pond water sampling.

Five sediment samples will be collected from each of the two C-Series Detention Ponds (Figure 7-4). One of the five sediment samples will be taken within the pond 5 feet from the inlet. A second sediment sample will be collected from the deepest part of each pond. The other three samples will be taken from random at locations within the pond as it exists at the time of sampling. The top 2 inches of bed material will be collected for VOC analysis and a 6-inch core will be collected for analysis of all other parameters. Sediment samples will be geologically logged according to SOP GT.1.

In addition to the above samples, grab sediment samples will be collected from discrete vertical intervals in the sediment core taken from the deepest part of the pond. These sediment samples will consist of composite samples collected at 2-inch intervals in this core. Each of these samples will be analyzed by a gamma radiation scan.

Sediment samples will also be collected along Woman Creek from the Concrete Wash Pad (IHSS 133.6) to Indiana Street and along the SID (Figure 7-2). There already exists data on the sediments in the OU5 area (see Section 2.0). In developing the OU5 sediment sampling program, the areas where each IHSS would impact this drainage have been estimated so that the additional field sampling locations can be positioned downstream of these impact areas (Figure 7-5). These impact areas have been estimated by defining the area where surface water runoff from each IHSS intercept the drainage.

Based on these impact areas, additional field sampling locations have been positioned downgradient of each IHSS where there was a lack of existing data (Figure 7-5). Table 7-4 lists these additional sediment sampling locations proposed for OU5 and their purposes, along with what existing sediment locations will be used to characterize each area. The sediment samples collected from each pond are not included on Table 7-4. Generally, additional sampling locations are placed downstream of each IHSS and along each stream segment where existing data is lacking to characterize the stream sediment (Table 7-4 and Figure 7-5). Data from these additional sampling locations along with the sediment data that has already been collected will be used to evaluate Woman Creek and the SID in OU5 for the Phase I RI Investigation.

The sediment samples from Woman Creek and the SID will be collected within the creek or ditch at points that are conducive to the collection of sediment. The top 2 inches of bed material will be collected for VOC analysis and a 6-inch core will be collected for analysis of all other parameters. All sediment samples will be collected according to SOP SW.6 and the SOP Addendum (SOPA) to SOP SW.6 in Section 11.0 of this document. The chemical analyses that will be performed on these samples is presented in Subsection 7.3.

Figure 7-5 Sediment Sampling Sites and IHSS Impact Areas Along the SID and Nearby Tributaries

Figure 7-5, continued

TABLE 7-4

PROPOSED SEDIMENT SAMPLING PROGRAM*

	IHSS or Stream Segment	Proposed Locations	Existing Locations	Purpose
1.	Ash Pits, Concrete Wash Pad, and Incinerator (Woman Creek)	2	SED-14 and SED-17	Characterize Woman Creek sediment downstream of IHSS 133
2.	Original Landfill (Woman Creek and SID)	4	0	Characterize sediments downstream of Landfill in both SID and Woman Creek
3.	Between IHSS 115 and Pond C-1	1	SED-126	Characterize sediments in SID and Woman Creek
4.	SID Between Pond C-1 and C-2	0	SED-28, SED-31, SED-29, and SED-30	Characterize SID
5.	Woman Creek between C-1 and C-2	1	SED-27, SED-26, and SED-25	Characterize Woman Creek between ponds
6.	Woman Creek between C-2 and Indiana Street	4	SED-1, SED-2, and SED-24	Characterize Woman Creek and Unnamed Ditch

* The 5 sediment samples for each pond are not included in this table.

Stage 4 – Monitoring Well Installation and Groundwater Sampling

Two monitoring wells will be installed immediately downgradient of each dam at Detention Ponds C-1 and C-2, thus providing a total of four monitoring wells in this area (Figure 7-4). The wells will be constructed within the original stream channel according to SOP GT.6 and will monitor the saturated alluvium. If a water-bearing sandstone unit is found to be the first bedrock unit underlying the alluvium in a boring, then an additional well will be completed in the sandstone at that location. Following development of the wells according to SOP GW.2, the wells will be sampled according to SOPs GW.5 and GW.6. Results of the first round of well sampling will be reported in the Phase I RI Report. These wells will be sampled quarterly for 1 year. The chemical analyses that will be performed on these samples are discussed in Subsection 7.3.

7.2.4 IHSS 209 - Surface Disturbance Southeast of Building 881 and Other Surface Disturbances

There are three surface disturbances that will be evaluated during the Phase I investigation: IHSS 209, the surface disturbance west of IHSS 209, and the surface disturbances south of the Ash Pits (Figures 7-3 and 7-4). The Phase I field sampling programs for these areas are similar and are described below. Table 7-5 summarizes the proposed program for these areas.

Stage 1 – Review Aerial Photographs

Available aerial photographs, including those from 1964, 1969, 1971, and 1983, will be reviewed to evaluate the nature and use of IHSS 209, the surface disturbance west of IHSS 209, and the surface disturbance south of the Ash Pits (see Table 7-5). These photos will help to determine if there are any specific areas within each of these surface disturbances that should be investigated more comprehensively. In addition, the features that appears to be a pond at IHSS 209 in a 1983 and 1988 aerial photo will be evaluated.

Stage 2 – Visual Inspection and Radiation Survey

A visual inspection will be conducted over the three surface disturbances to identify any stained soil and anomalous surface areas. A FIDLER radiation survey will also be performed at the areas according to SOP FO.16. This survey will be conducted randomly over each surface disturbance. If areas of anomalous radiation readings are detected, the survey will be adjusted to pinpoint the radiation source. The results of the surveys will be plotted on a map and contoured, if appropriate. The radiation surveys will be conducted using a side-shielded FIDLER and a shielded G-M pancake-type detector. If appropriate, the Stage 3 field sampling program will be adjusted to investigate anomalies identified from the Stage 2 visual inspection and radiation survey.

TABLE 7-5

PHASE I INVESTIGATION
IHSS 209 - SURFACE DISTURBANCE SOUTHEAST OF BUILDING 881, THE SURFACE DISTURBANCE WEST OF IHSS 209 AND THE SURFACE DISTURBANCES SOUTH OF THE ASH PITS

Activity	Purpose	Location	Sample Number
Stage 1			
1. Review Aerial Photographs	Evaluate nature and use of sites and nature of the ponds at IHSS 209	IHSS 209, surface disturbance west of IHSS 209 and surface disturbances south of the Ash Pits	NA
Stage 2			
2. Visual Inspection	Identify stained soil areas	IHSS 209, surface disturbance west of IHSS 209 and surface disturbances south of the Ash Pits	NA
3. Radiation Survey	Locate areas of anomalous radiation readings	Random survey over area	NA
Stage 3			
4. Sample Sediment and Surface Water	Characterize the two ponds on IHSS 209	From the center of the ponds at IHSS 209	2 each sediment and surface water
5. Soil Borings including 0-6-inch surface sample	Evaluate surface disturbances	IHSS 209 – 1 boring in each of the three former excavations; for the surface disturbance west of IHSS 209 1 boring in each of the five disturbed areas; for the disturbance south of Ash Pits, 2 in each of the three parallel excavations, 4 in west fill area, and 1 in east fill area.	19

NA - Not Applicable

Stage 3 – Sediment, Surface Water, Surface Soil, and Borehole Samples

A sediment sample and surface water sample, if present, will be collected from the deepest part of both pond-like depressions at IHSS 209 according to SOPs SW.1, SW.2, SW.3, and SW.6 (Figure 7-4).

Surface soil samples will be collected at 19 locations to characterize possible contamination in the surface soils (Figures 7-3 and 7-4). Samples will be collected according to the sampling procedures specified in SOP GT.8.

A total of 19 boreholes will be drilled and sampled in the surface disturbance areas (Figures 7-3 and 7-4). The borings will be drilled to a depth of 12 feet and will be drilled and sampled according to SOP GT.2. The borings will be logged according to SOP GT.1. Samples will be taken continuously. Discrete samples will be collected from every 2-foot increment and analyzed for the TCL VOCs. Two 6-foot composites will be analyzed for the TCL semivolatile organic compounds, the TAL metals, and radionuclides.

In addition, surface soil and subsurface samples will be collected at any areas of anomalous radiation readings or stained areas identified from the visual inspection and radiation surveys of these disturbed areas.

During sampling, a soil classification survey will be completed at the Surface Disturbances for use in the Environmental Evaluation. Several samples may also be collected from 0 to 2 feet for grain size analysis.

7.2.4.1 Area South of OU5 to the Property Boundary

Surface soils in the area south of the OU5 to the property boundary will be sampled for plutonium, americium, and uranium as part of OUs 1, 2, and 3 RFI/RIs. The Background and Site-Wide Sampling Programs for the Rocky Flats Plant will provide additional coverage for the area south of OU5 to the property boundary. For example, the Background Sampling Program includes sediment and surface water stations (SED-18 and -19; and SW-80, -104, and -130) for the Antelope Springs area and on Smart Ditch at the western boundary of the Plant. The Site-Wide Monitoring Activities will include sediment and surface water sampling in Pond C-1 and surface water sampling near Indiana Avenue. The exact station locations have not been finalized. The Background and Site-Wide Monitoring Programs use the same sampling protocols and Quality Assurance (QA)/Quality Control (QC) procedures as the OU programs. Therefore, the data will be comparable.

If the work done for OUs 1-3, the Background, or Site-Wide Sampling Activities detect any contaminants at significant levels (above acceptable risk range, background, or potential ARAR), further investigation of this area will be covered under the OU5 investigation.

7.2.5 Ambient Air Monitoring Program

Three Hi-Vol air sampling devices will be installed near the Woman Creek drainage to monitor the air pathway from this OU (Figure 7-2). One will be located northwest of the Ash Pits (IHSS 133) and the Old Landfill (IHSS 115) to provide background data. The second air monitoring station will be placed between the Ash Pits and the Old Landfill, with the third southeast of the Old Landfill.

The data obtained from these stations, as well as the existing nearby air stations, will be used to evaluate the air emissions from this area. There are currently seven air monitoring stations (S-10, S-11, S-13, S-14, S-23, S-37, and S-38) near the Woman Creek drainage (Figure 7-2). The three proposed monitoring stations will be sampled in accordance with the Site-Wide Ambient Air Monitoring Program currently being conducted by EG&G at the Rocky Flats Plant. Briefly, the operation and sampling procedures are described below.

Air coming in contact with the Hi-Vol Ambient Air samples is forced through a filter material, trapping radioactive particulates and other airborne matter for subsequent analysis. Performance data from these Radioactive Ambient Air Monitoring Program (RAAMP) air samplers are collected by Environmental Monitoring and Assessment Technologists (EMAT) on a weekly basis, and air filters are replaced every 2 weeks. Once a month, the two filters collected from each air monitoring station are composited, and one sample from each air monitoring station is sent to Radiological Health Labs (Building 123) at the Plant for analysis. Detailed procedures describing the air sampler operations, filter exchange, filter preparation for analysis, RAAMP documentation, and reporting requirements are contained in SOP AP.13. These air samples will be analyzed according to the procedures outlined in the General Radiochemistry and Routine Analytical Services Protocol (GRRASP). The samples will be analyzed for the same analytes as are analyzed in the site-wide program, which is currently plutonium. The analytical program for the site-wide Ambient Air Program is expected to be expanded in the near future to include other radionuclides, at which time the analytical program for the three proposed OU5 air stations will also be increased.

7.3 SAMPLE ANALYSIS

This section describes the sample handling procedures and analytical program for samples collected from the Phase I investigation. In this section, sample designations, analytical requirements, sample containers and preservation, and sample handling and documentation requirements will be discussed.

7.3.1 Sample Designations

All sample designations generated for this RFI/RI will conform to the input requirements of the Rocky Flats Environmental Database System (RFEDS). Each sample designation will contain a nine-character sample number consisting of a two-letter prefix identifying the media sampled (e.g., "SB" for soil borings, "SS" for stream sediments), a unique five-digit number, and a two-letter suffix identifying the contractor

(e.g., "WC" for Woodward-Clyde). One sample number will be required for each sample generated, including QA/QC samples. In this manner, 99,999 unique sample numbers are available for each contractor that contributes sample data to the data base. A block of numbers will be reserved for the Phase I RFI/RI sampling of OU5. Boring numbers will be developed independently of the sample numbers from a boring. Specific sample location numbers are not assigned at this time, pending the results of the aerial photograph analysis and review of existing data.

7.3.2 Analytical Requirements

Generally, samples collected during the Phase I RI will be analyzed for some or all of the following chemical and radionuclide parameters:

- Nitrate
- TAL metals
- Uranium 233/234, 235, and 238
- Transuranic elements (plutonium and americium)
- Cesium 137 and strontium 89/90
- Gross alpha and gross beta
- Tritium
- Total dissolved chromium (water only)
- Beryllium
- TCL volatile organics
- TCL semivolatile organics
- Total organic carbon (TOC)
- TCL pesticides/PCBs
- CO_3, HCO_3, Cl, SO_4, NO_3 (water only)

The specific analytes in the groups listed above and their detection/quantitation limits are contained in Table 7-6. Table 3-1 lists the analytical methods that will be used for each analyte. The specific Phase I analytical programs for each IHSS are contained in Table 7-7. Both filtered and unfiltered surface water and groundwater samples will be analyzed at each location.

The analytical program for each media at every IHSS is summarized in Table 7-7. The analytical program for each IHSS was developed in the IAG based on the type of waste suspected to be present at each site. The specific analytes and detection/quantitation limits are specified in the IAG by reference to Contract Laboratory Program (CLP) analyses. The GRRASP (EG&G 1990f) provides a listing of CLP analytes and limits that will be used for this Phase I RFI/RI. These analytes and limits are presented in Table 7-6. The program shown in Table 7-7 should address the bulk of chemicals and compounds that were handled or are suspected to be present at OU5 and enable detection of soil, sediment, surface water, and groundwater contamination, if present.

TABLE 7-6

PHASE I
SOIL, SEDIMENT, AND WATER SAMPLING PARAMETERS AND DETECTION LIMITS

	DETECTION LIMITS*	
TARGET ANALYTE LIST - METALS	Water (ug/l)	Soil/Sediment (mg/kg)
Aluminum	200	40
Antimony	60	12
Arsenic	10	2
Barium	200	40
Beryllium	5	1.0
Cadmium	5	1.0
Calcium	5000	2000
Cesium	1000	200
Chromium	10	2.0
Cobalt	50	10
Copper	25	5.0
Cyanide	10	10
Iron	100	20
Lead	5	1.0
Lithium	100	20
Magnesium	5000	2000
Manganese	15	3.0
Mercury	0.2	0.2
Molybdenum	200	40
Nickel	40	8.0
Potassium	5000	2000
Selenium	5	1.0
Silver	10	2.0
Sodium	5000	2000
Strontium	200	40
Thallium	10	2.0
Tin	200	40
Vanadium	50	10.0
Zinc	20	4.0
TOTAL ORGANIC CARBON	1	1
	QUANTITATION LIMITS*	
TARGET COMPOUNDS LIST - VOLATILES	Water (ug/l)	Soil/Sediment (ug/kg)
Chloromethane	10	10
Bromomethane	10	10
Vinyl Chloride	10	10
Chloroethane	10	10
Methylene Chloride	5	5
Acetone	10	10
Carbon Disulfide	5	5
1,1-Dichloroethene	5	5
1,1-Dichloroethane	5	5

TABLE 7-6
(Continued)

PHASE I
SOIL, SEDIMENT, AND WATER SAMPLING PARAMETERS
AND DETECTION LIMITS

	QUANTITATION LIMITS*	
TARGET COMPOUNDS LIST - VOLATILES (Continued)	Water (ug/l)	Soil/Sediment (ug/kg)
total 1,2-Dichloroethene	5	5
Chloroform	5	5
1,2-Dichloroethane	5	5
2-Butanone	10	10
1,1,1-Trichloroethane	5	5
Carbon Tetrachloride	5	5
Vinyl Acetate	10	10
Bromodichloromethane	5	5
1,1,2,2-Tetrachloroethane	5	5
1,2-Dichloropropane	5	5
trans-1,3-Dichloropropene	5	5
Trichloroethene	5	5
Dibromochloromethane	5	5
1,1,2-Trichloroethane	5	5
Benzene	5	5
cis-1,3-Dichloropropene	5	5
Bromoform	5	5
2-Hexanone	10	10
4-Methyl-2-pentanone	10	10
Tetrachloroethene	5	5
Toluene	5	5
Chlorobenzene	5	5
Ethyl Benzene	5	5
Styrene	5	5
Total Xylenes		

	QUANTITATION LIMITS*	
TARGET COMPOUNDS LIST - SEMIVOLATILES	Water (ug/l)	Soil/Sediment (ug/kg)
Phenol	10	330
bis(2-Chloroethyl)ether	10	330
2-Chlorophenol	10	330
1,3-Dichlorobenzene	10	330
1,4-Dichlorobenzene	10	330
Benzyl Alcohol	10	330
1,2-Dichlorobenzene	10	330
2-Methylphenol	10	330
bis(2-Chloroisopropyl)ether	10	330
4-Methylphenol	10	330
N-Nitroso-di-n-dipropylamine	10	330
Hexachloroethane	10	330

TABLE 7-6
(Continued)

PHASE I
SOIL, SEDIMENT, AND WATER SAMPLING PARAMETERS
AND DETECTION LIMITS

	QUANTITATION LIMITS*	
TARGET COMPOUND LIST - SEMIVOLATILES (Continued)	Water (ug/l)	Soil/Sediment (ug/kg)
Nitrobenzene	10	330
Isophorone	10	330
2-Nitrophenol	10	330
2,4-Dimethylphenol	10	330
Benzoic Acid	50	1600
bis(2-Chloroethoxy)methane	10	330
2,4-Dichlorophenol	10	330
1,2,4-Trichlorobenzene	10	330
Naphthalene	10	330
4-Chloroaniline	10	330
Hexachlorobutadiene	10	330
4-Chloro-3-methylphenol(para-chloro-meta-cresol)	10	330
2-Methylnaphthalene	10	330
Hexachlorocyclopentadiene	10	330
2,4,6-Trichlorophenol	10	330
2,4,5-Trichlorophenol	50	1600
2-Chloronaphthalene	10	330
2-Nitroaniline	50	1600
Dimethylphthalate	10	330
Acenaphthylene	10	330
2,6-Dinitrotoluene	10	330
3-Nitroaniline	50	1600
Acenaphthene	10	330
2,4-Dinitrophenol	50	1600
4-Nitrophenol	50	1600
Dibenzofuran	10	330
2,4-Dinitrotoluene	10	330
Diethylphthalate	10	330
4-Chlorophenyl Phenyl ether	10	330
Fluorene	10	330
4-Nitroaniline	50	1600
4,6-Dinitro-2-methylphenol	50	1600
N-nitrosodiphenylamine	10	330
4-Bromophenyl Phenylether	10	330
Hexachlorobenzene	10	330
Pentachlorophenol	50	1600
Phenanthrene	10	330
Anthracene	10	330
Di-n-butylphthalate	10	330
Fluoranthene	10	330
Pyrene	10	330
Butylbenzylphthalate	10	330

TABLE 7-6
(Continued)

PHASE I
SOIL, SEDIMENT, AND WATER SAMPLING PARAMETERS
AND DETECTION LIMITS

TARGET COMPOUND LIST - SEMIVOLATILES (Continued)	Water (µg/l)	Soil/Sediment (µg/kg)
3,3'-Dichlorobenzidine	20	660
Benzo(a)anthracene	10	330
Chrysene	10	330
bis(2-Ethylhexyl)phthalate	10	330
Di-n-octylphthalate	10	330
Benzo(b)fluoranthene	10	330
Benzo(k)fluoranthene	10	330
Benzo(a)pyrene	10	330
Indeno(1,2,3-cd)pyrene	10	330
Dibenz(a,h)anthracene	10	330
Benzo(g,h,i)perylene	10	330

TARGET COMPOUND LIST - PESTICIDES/PCBS	QUANTITATION LIMITS*	
	Water µg/l	Soil/Sediment µg/kg
alpha-BHC	0.05	8.0
beta-BHC	0.05	8.0
delta-BHC	0.05	8.0
gamma-BHC (Lindane)	0.05	8.0
Heptachlor	0.05	8.0
Aldrin	0.05	8.0
Heptachlor epoxide	0.05	8.0
Endosulfan I	0.05	8.0
Dieldrin	0.10	16.0
4,4'-DDD	0.10	16.0
Endrin	0.10	16.0
Endosulfan II	0.10	16.0
4,4'-DDD	0.10	16.0
Endosulfan sulfate	0.10	16.0
4,4'-DDT	0.10	16.0
Methoxychlor	0.5	80.0
Endrin ketone	0.10	16.0
alpha-Chlordane	0.5	80.0
gamma-Chlordane	0.5	80.0
Toxaphene	1.0	160.0
Aroclor-1016	0.5	80.0
Aroclor-1221	0.5	80.0
Aroclor-1232	0.5	80.0
Aroclor-1242	0.5	80.0
Aroclor-1248	0.5	80.0
Aroclor-1254	1.0	160.0
Aroclor-1260	1.0	160.0

TABLE 7-6
(Concluded)

PHASE I
SOIL, SEDIMENT, AND WATER SAMPLING PARAMETERS
AND DETECTION LIMITS

	REQUIRED DETECTION LIMITS*	
RADIONUCLIDES	Water (pCi/ℓ)	Soil/Sediment (pCi/g)
Gross Alpha	2	4 dry
Gross Beta	4	10 dry
Uranium 233+234, 235, and 238 (each species)	0.6	0.3 dry
Americium 241	0.01	0.02 dry
Plutonium 239+240	0.01	0.03 dry
Tritium	400	400 (pCi/ml)
Cesium 137	1	0.1 dry
Strontium 89+90	1	1 dry

	DETECTION LIMITS*
Parameters Exclusively for Groundwater Samples	Water (mg/ℓ)
ANIONS	
Carbonate	10
Bicarbonate	10
Chloride	5
Sulfate	5
Nitrate as N	5
FIELD PARAMETERS	
pH	0.1 pH unit
Specific Conductance	1
Temperature	
Dissolved Oxygen	0.5
Barometric Pressure	
INDICATORS	
Total Dissolved Solids	5

- Detection and quantitation limits are highly matrix dependent. The limits listed here are the minimum achievable under ideal conditions. Actual limits may be higher.

TABLE 7-7

PHASE I ANALYTICAL PROGRAM

IHSS	Location	Media	Total Cr	Be	H3	Nitrate	Gross α	Gross β	U 233/234	U 235	U 238	Pu 239/240	Am 241
115	Borings to confirm soil gas	Soil											
	Borings transecting plumes grabs from 2-ft. intervals 6-ft composites	Soil Soil		X			X	X	X	X	X	X	X
	Wells downgradient of unit	Water	X	X		X	X	X	X	X	X	X	X
	Effluent from pipes	Water	X	X		X	X	X	X	X	X	X	X
	Sediments in SID and Woman Creek	Seds.		X			X	X	X	X	X	X	X
	Water in SID and Woman Creek	Water		X			X	X	X	X	X	X	X
	Randomly selected surface soil samples	Soil		X			X	X	X	X	X	X	X
	Surface Soil RAD anomalies	Soil					X	X	X	X	X	X	X
133	Borings on 25-ft. centers	Soil					X	X	X	X	X	X	X
	Randomly collected surface samples	Soil		X			X	X	X	X	X	X	X
	Surface soil RAD anomalies	Soil					X	X	X	X	X	X	X
	Sediment samples downstream of ash pits	Seds.	X	X	X	X	X	X	X	X	X	X	X
	Wells downgradient of unit	Water	X	X			X	X	X	X	X	X	X
142	Sediment samples in Woman Creek, SID and ponds	Seds.	X	X	X	X	X	X	X	X	X	X	X
	Water samples from ponds	Water	X	X	X	X	X	X	X	X	X	X	X
	Wells downgradient of C-1 and C-2	Water	X	X	X	X	X	X	X	X	X	X	X
209	Sediment in former ponds	Seds.					X	X	X	X	X	X	X
	Water in former ponds	Water					X	X	X	X	X	X	X
	Soil in small depressions	Soil					X	X	X	X	X	X	X
	Borings in area 0-6-inch 2-ft. intervals 6-ft composites	Soil					X X	X X	X X	X X	X X	X X	X X

TABLE 7-7
(Concluded)
PHASE I ANALYTICAL PROGRAM

IHSS	Location	Media	TAL Metals	TOC	TCL Vols	TCL Semi V	TCL Pest	Filtered									
								U	Pu 239/240	Cs 137	Sr 89/90	Am 241	Pb	Total Cr	TAL Metals	Be	Anions TDS
115	Borings to confirm soil gas	Soil			X		X										
	Borings transecting plumes																
	grabs from 2-ft. intervals	Soil			X												
	6-ft. composites	Soil	X			X	X										
	Wells downgradient of unit	Water	X		X	X		X	X	X	X	X	X	X			X
	Effluent from pipes	Water	X		X	X	X	X	X	X	X	X	X	X			X
	Sediments in SID and Woman Creek	Seds.	X		X	X	X	X	X	X	X	X	X	X			
	Water in SID and Woman Creek	Water	X		X	X	X	X	X	X	X	X	X	X			X
	Surface soil samples		X	X		X	X										
	Surface soil RAD anomalies																
133	Borings on 25-ft. centers	Soil	X														
	Surface soil samples	Soil	X	X													
	Surface soil RAD anomalies																
	Sediment samples downstream of ash pits	Seds.	X	X													
	Wells downgradient of unit	Water	X		X	X		X	X	X	X	X				X	X
142	Sediment samples in Woman Creek, SID, and Ponds	Seds.	X	X	X	X	+										
	Water samples from ponds	Water	X		X	X		X	X	X	X	X			X	X	X
	Wells downgradient of C-1 and C-2	Water	X		X	X		X	X	X	X	X			X	X	X
209	Sediment in former ponds	Seds.	X		X	X	X										
	Water in former ponds	Water	X		X	X											
	Soil in small depressions	Soil	X	X	X	X	X										
	Borings in area	Soil															
	0-6-inch – surface soil		X	X	X	X											
	2-ft. intervals				X												
	6-ft. composites		X	X		X											

+ TCL pesticides will be analyzed for Ponds C-1 and C-2 sediment samples only.

Nitrates are included because low-level radioactive wastes with high nitrate concentrations may be present in Woman Creek or the SID. Metals were probably disposed of at OU5; however, details are not well known. Therefore, all of the TAL metals have been selected for Phase I analysis.

Uranium is likely to have been a constituent of the wastes at OU5. The isotopes U-233, U-234, U-235, and U-238 have been selected for analysis in Phase I. Plutonium is the only transuranic element that is used on the site. However, americium is a daughter product of plutonium and is found at the Rocky Flats Plant. Therefore, plutonium and americium have also been selected as Phase I radionuclide parameters. Gross alpha and gross beta are included as screening parameters because they are useful indicators of radionuclides. Tritium, strontium, and cesium are also included in the analytical program.

Volatile and semivolatile organics may have been handled at OU5 in small quantities probably only at the Original Landfill. The specific compounds used are unknown; therefore, all of the TCL volatile and semivolatile organics will be included in the Phase I analyses for some samples.

TCL pesticides/PCBs and TOC have been included for some samples to provide data for the environmental evaluation. For the sediment samples collected from Woman Creek and the SID, TCL pesticides will be analyzed in the samples collected from the detention ponds and at the location just downgradient from the Original Landfill. The other sediment samples collected from Woman Creek and the SID will not be analyzed for TCL pesticides as no pesticides have been detected to date from the extensive sampling already performed (see Section 2.0). In addition, the two proposed sediment sampling locations just downstream of the Ash Pit will not be analyzed for TCL volatiles and semivolatiles since incineration would probably have destroyed these organics.

The analytical parameters for the soil gas survey at IHSS 115 are 1,1,1-trichloroethane (TCA), dichloromethane, benzene, carbon tetrachloride, tetrachloroethene (PCE), and trichloroethene (TCE). Detection limits proposed for these parameters during the soil gas survey are listed in Table 7-8.

7.3.3 Sample Containers and Preservation

Sample volume requirements, preservation techniques, holding times, and container material requirements are dictated by the media being sampled and by the analyses to be performed. The soil matrices to be analyzed will include soils and sediments. The water matrices for analysis will include surface water and groundwater. Tables 7-9 and 7-10 list analytical parameters of interest in OU5 for water and soil matrices, along with the associated container size, preservatives (chemical and/or temperature), and holding times. Additional specific guidance on the appropriate use of containers and preservatives is provided in SOP FO.13, Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples.

TABLE 7-8
PHASE I INVESTIGATION
SOIL GAS PARAMETERS AND
PROPOSED DETECTION LIMITS

IHSS-115 Original Landfill

Volatiles	Detection Limit
1,1,1 TCA	1 µg/ℓ
Dichloromethane	1 µg/ℓ
Benzene	1 µg/ℓ
Carbon Tetrachloride	1 µg/ℓ
PCE	1 µg/ℓ
TCE	1 µg/ℓ

NOTE: Detection limits are a function of the detector type and injection volume. Thus, the detection limit may vary.

TABLE 7-9

SAMPLE CONTAINERS, SAMPLE PRESERVATION, AND SAMPLE HOLDING TIMES FOR WATER SAMPLES

Parameter	Container	Preservative	Holding Time
Liquid - Low to Medium Concentration Samples			
Organic Compounds:			
Purgeable Organics (VOCs)	2 x 40-mℓ VOA vials with teflon-lined septum lids	Cool, 4°C[a] with HCl to pH<2	7 days 14 days
Extractable Organics (BNAs), Pesticides and PCBs	1 x 4-ℓ amber[b] glass bottle	Cool, 4°C[a]	7 days until extraction, 40 days after extraction
Inorganic Compounds:			
Metals (TAL)	1 x 1-ℓ polyethylene bottle	Nitric acid pH<2; Cool, 4°C	180 days[c]
Cyanide	1 x 1-ℓ polyethylene bottle	Sodium hydroxide[d] pH>12; Cool, 4°C	14 days
Anions	1 x 1-ℓ polyethylene bottles	Cool, 4°C	14 days
Sulfide	1 x 1-ℓ polyethylene bottle	1 mℓ-zinc acetate sodium hydroxide to pH>9; Cool, 4°C	7 days
Nitrate	1 x 1-ℓ polyethylene bottle	Cool, 4°C	48 hours
Total Dissolved Solids (TDS)	1 x 1-ℓ polyethylene bottle	Cool, 4°C	48 hours
Radionuclides	1 x 1-ℓ polyethylene bottle	Nitric acid pH<2;	180 days

[a] Add 0.008% sodium thiosulfate ($Na_2S_2O_3$) in the presence of residual chlorine

[b] Container requirement is for any or all of the parameters given.

[c] Holding time for mercury is 28 days.

[d] Use ascorbic acid only if the sample contains residual chlorine. Test a drop of sample with potassium iodine-starch test paper; a blue color indicates need for treatment. Add ascorbic acid, a few crystals at a time, until a drop of sample produces no color on the indicator paper. Then add an additional 0.6g of ascorbic acid for each liter of sample volume.

TABLE 7-10

SAMPLE CONTAINERS, SAMPLE PRESERVATION, AND SAMPLE HOLDING TIMES FOR SOIL SAMPLES

Parameter	Container	Preservative	Holding Time
Soil or Sediment Samples - Low to Medium Concentration			
Organic Compounds:			
Purgeable Organics (VOCs)	1 x 4-oz wide-mouth teflon-lined glass vials	Cool, 4°C	14 days
Extractable Organics (BNAs), Pesticides and PCBs	1 x 8-oz wide-mouth teflon-lined glass vials	Cool, 4°C	7 days until extraction, 40 days after extraction
Inorganic Compounds:			
Metals (TAL)	1 x 8-oz wide-mouth glass jar	Cool, 4°C	180 days[1]
Cyanide	1 x 8-oz wide-mouth glass jar	Cool, 4°C	14 days
Sulfide	1 x 8-oz wide-mouth glass jar	Cool, 4°C	28 days
Nitrate	1 x 8-oz wide-mouth glass jar	Cool, 4°C	48 hours
Radionuclides	1 x 1-ℓ wide-mouth glass jar	None	45 days

[1]Holding time for mercury is 28 days.

7.3.4 Sample Handling and Documentation

Sample control and documentation is necessary to ensure the defensibility of data and to verify the quality and quantity of work performed in the field. Accountable documents include logbooks, data collection forms, sample labels or tags, chain-of-custody forms, photographs, and analytical records and reports. Specific guidance defining the necessary sample control, identification, and chain-of-custody documentation is discussed in SOP FO.14.

7.3.5 Data Reporting Requirements

Field data will be input into the RFEDS using a remote data entry module supplied by EG&G. Data will be entered on a timely basis and a 3.5-inch diskette will be delivered to EG&G. A hard copy report will be generated from the module for contractor use. The data will be put through a prescribed QC process based on SOP FO.14 to be generated by EG&G.

A sample tracking spreadsheet will be maintained by the contractor for use in tracking sample collection and shipment. EG&G will supply the spreadsheet format and will stipulate the timely reporting of the information. This data will also be delivered to EG&G on 3.5-inch diskettes. Computer hardware and software requirements for contractors using government supplied equipment will be supplied by EG&G. Computer and data security will also follow acceptable procedures outlined by EG&G.

7.4 FIELD QC PROCEDURES

Sample duplicates, field preservation blanks, and equipment rinsate blanks will be prepared. Trip blanks will be obtained from the laboratory. The analytical results obtained for these samples will be used by the Environmental Restoration (ER) Project Manager to assess the quality of the field sampling effort. The types of field QC samples to be collected and their application are discussed below. The frequency for QC samples to be collected and analyzed is provided in Table 7-11.

Duplicate samples will be collected by the sampling team and will be used as a relative measure of the precision of the sample collection process. These samples will be collected at the same time, using the same procedures, the same equipment, and in the same types of containers as required for the samples. They will also be preserved in the same manner and submitted for the same analyses as required for the samples.

Field preservation blanks of distilled water, preserved according to the preservation requirements (Subsection 7.3.3), will be prepared by the sampling team and will be used to provide an indication of any contamination introduced during field sample preparation technique. As indicated by Table 7-11, these QC samples are applicable only to samples requiring chemical preservation. Equipment (rinsate) blanks will be collected from a final decontamination rinse to evaluate the success of the field sampling team's decontamination efforts on nondedicated sampling equipment.

TABLE 7-11

FIELD QC SAMPLE FREQUENCY

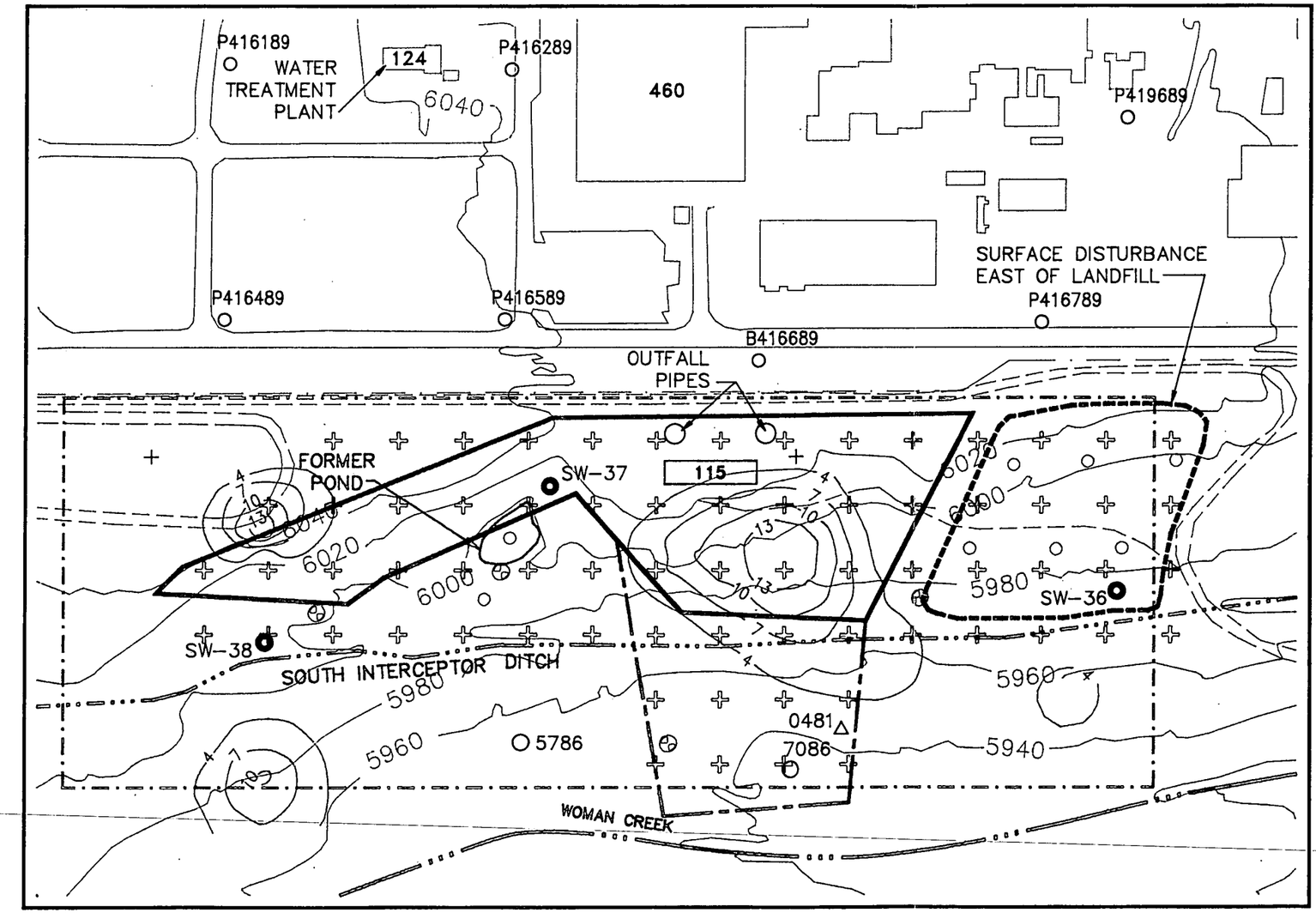
Sample Type	Type of Analysis	Media	
		Solids	Liquids
Duplicates	Organics	1/10	1/10
	Inorganics	1/10	1/10
	Radionuclides	1/10	1/10
Field Preservation Blanks	Organics	NA	NA
	Inorganics	NA	1/20
	Radionuclides	NA	1/20
Equipment Rinsate Blanks	Organics	1/20	1/20
	Inorganics	1/20	1/20
	Radionuclides	1/20	1/20
Trip Blanks	Organics (Volatiles)	NR	1/20
	Inorganics	NR	NR
	Radionuclides	NR	NR

NA = Not Applicable
NR = Not Required

Equipment blanks are obtained by rinsing cleaned equipment with distilled water prior to sample collection. The rinsate is collected and placed in the appropriate sample container. Equipment rinsate blanks are applicable to all analyses for water and soil samples as indicated in Table 7-11.

Trip blanks consisting of deionized water will be prepared by the laboratory technician and will accompany each shipment of water samples for volatile organic analysis. Trip blanks will be stored with the group of samples with which they are associated. Analysis of the trip blank will indicate migration of volatile organics or problems associated with the shipment, handling, or storage of the samples.

Procedures for monitoring field QC are given in the site-wide Quality Assurance Project Plan (QAPjP).



N

0 100 200

SCALE: 1" = 200'

EXPLANATION

- 115 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE
- SW-1 — EXISTING SURFACE WATER SAMPLING LOCATION
- 5786 — EXISTING ALLUVIAL GROUNDWATER MONITORING WELL
- 0481 — PRE-1986 MONITORING WELL
- INTERMITTENT STREAM
- DIRT ROAD
- 124 — ROCKY FLATS BLDG. NO.
- PRELIMINARY EXTENSION OF THE LANDFILL BASED ON A SITE RECONNAISSANCE
- PROPOSED WELL LOCATION*
- PROPOSED SOIL BORING LOCATION*
- PROPOSED SOIL GAS SAMPLES*
- ^{238}U (pCi/G) ISOCONCENTRATION CONTOURS
- 1990 GERMANIUM SURVEY BOUNDARY AROUND OLD LANDFILL

*ALL PROPOSED LOCATIONS ARE APPROXIMATE

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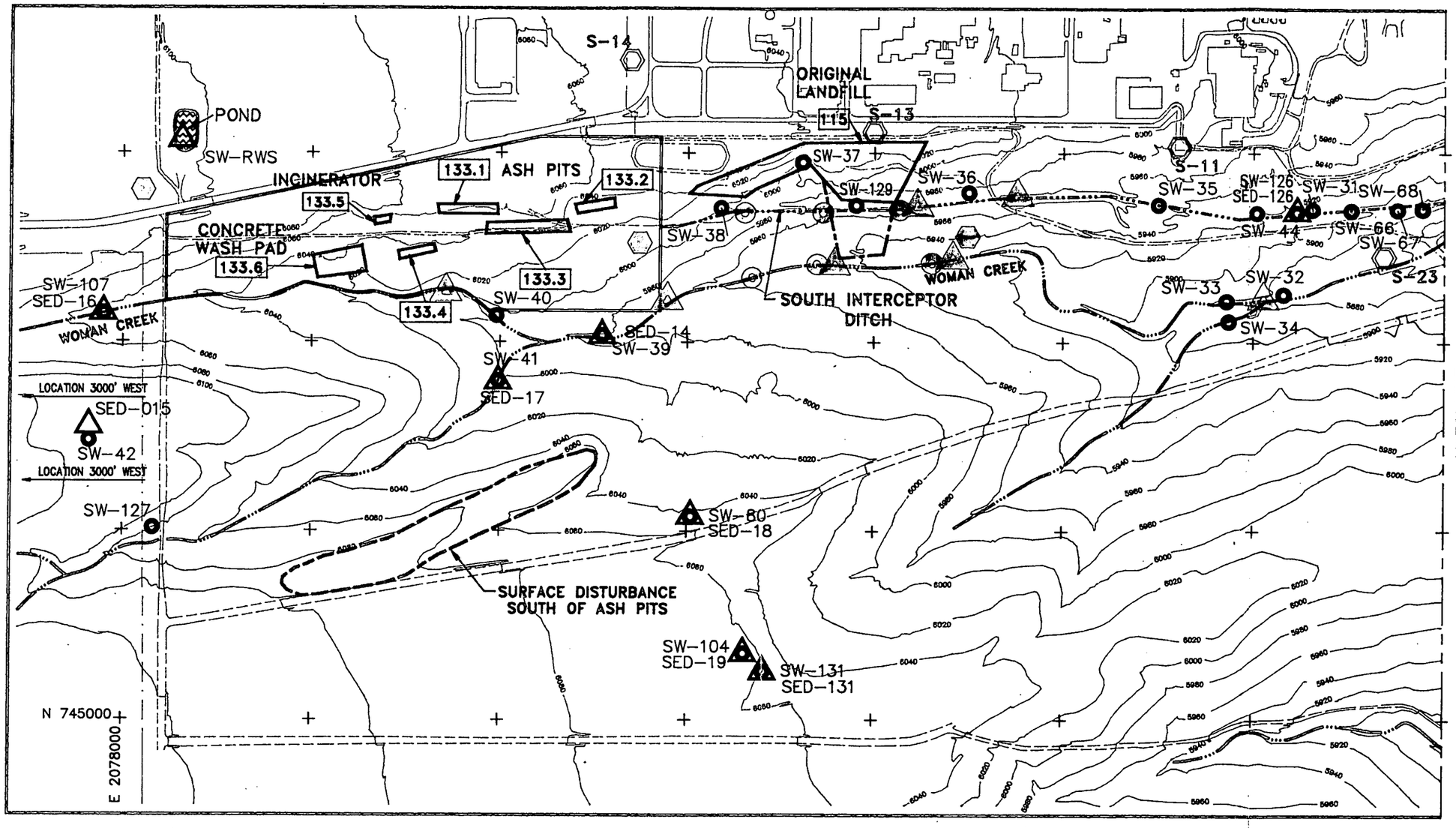
PHASE I RFI/RI WORK PLAN

PROPOSED SAMPLING AND WELL LOCATIONS IHSS 115 ORIGINAL LANDFILL

FIGURE 7-1

REV. FEB. 1992
MARCH 1991

R33M080.021292/200



EXPLANATION

- 115 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE
- SW-1 — EXISTING SURFACE WATER LOCATION
- SED-1 — EXISTING SEDIMENT SAMPLING LOCATION
- INTERMITTENT STREAM
- DIRT ROAD
- PRELIMINARY EXTENSION OF THE SURFACE DISTURBANCE BASED ON A RECONNAISSANCE
- S-23 — EXISTING RADIOACTIVE AMBIENT AIR MONITORING PROGRAM LOCATION
- PROPOSED SEDIMENT SAMPLE LOCATION
- PROPOSED RADIOACTIVE AMBIENT AIR MONITORING PROGRAM LOCATION
- PROPOSED SURFACE WATER LOCATION
- PROPOSED GERMANIUM SURVEY FOR ASH PIT AREA

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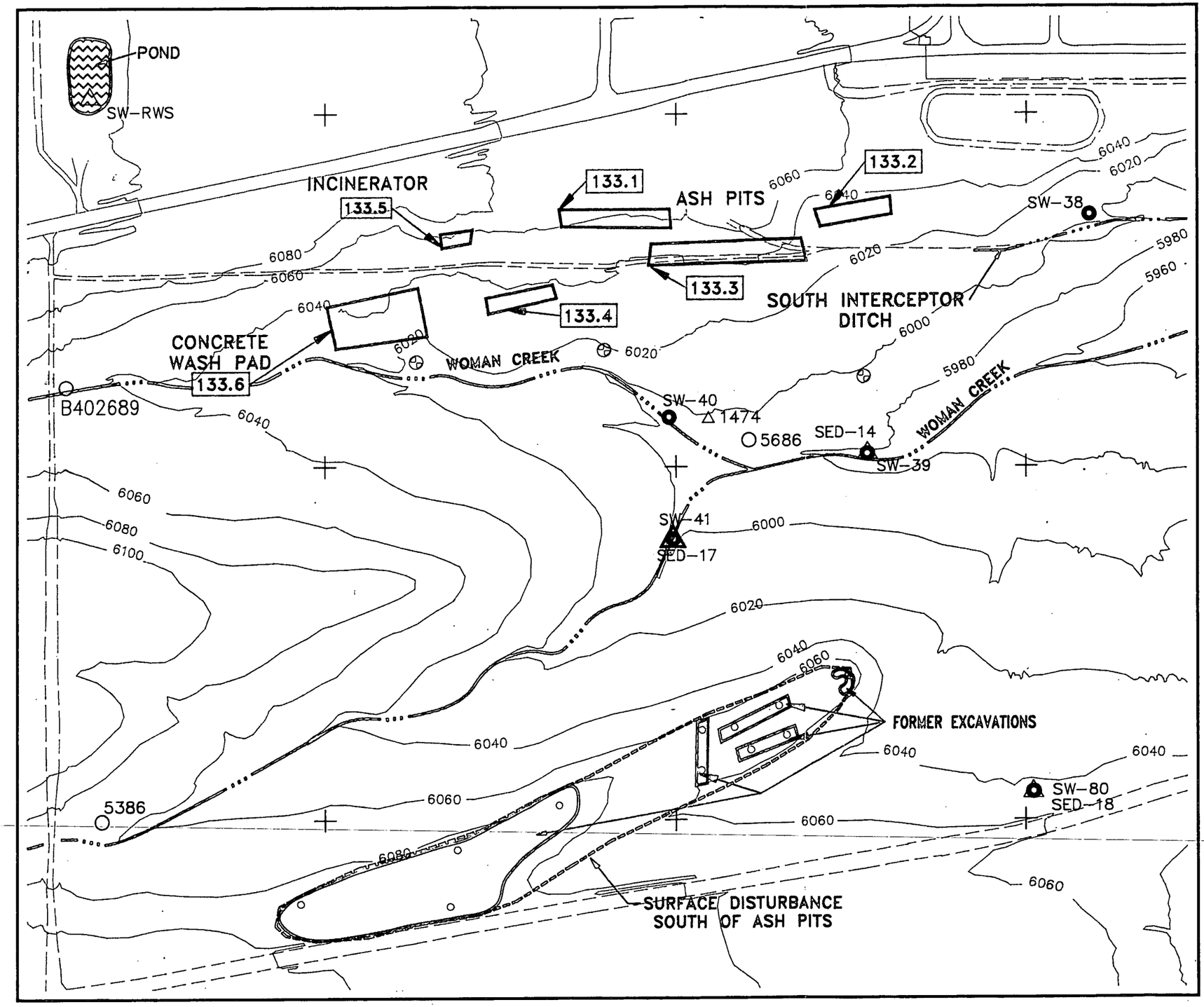
PHASE I RFI/RI WORK PLAN

SEDIMENT & SURFACE WATER SAMPLING SITES & AIR MONITORING STATIONS ALONG WOMAN CREEK AND THE SOUTH INTERCEPTOR DITCH

FIGURE 7-2 (1 OF 2)

REV. FEB. 1992
MARCH 1991

R33M081.MB021392/600



N

0 150 300

SCALE: 1" = 300'

EXPLANATION

- 115 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE
- SW-1 ● — EXISTING SURFACE WATER SAMPLING LOCATION
- 5786 ○ — EXISTING ALLUVIAL GROUNDWATER MONITORING WELL
- SED-17 △ — EXISTING SEDIMENT SAMPLING LOCATION
- 1474 △ — PRE-1986 MONITORING WELL
- ○ — PROPOSED SOIL BORING AND SURFACE SAMPLING LOCATION*
- ⊕ — PROPOSED WELL LOCATION
- — • • — INTERMITTENT STREAM
- ======== DIRT ROAD

*ALL PROPOSED LOCATIONS ARE APPROXIMATE

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Rocky Flats Plant, Golden, Colorado

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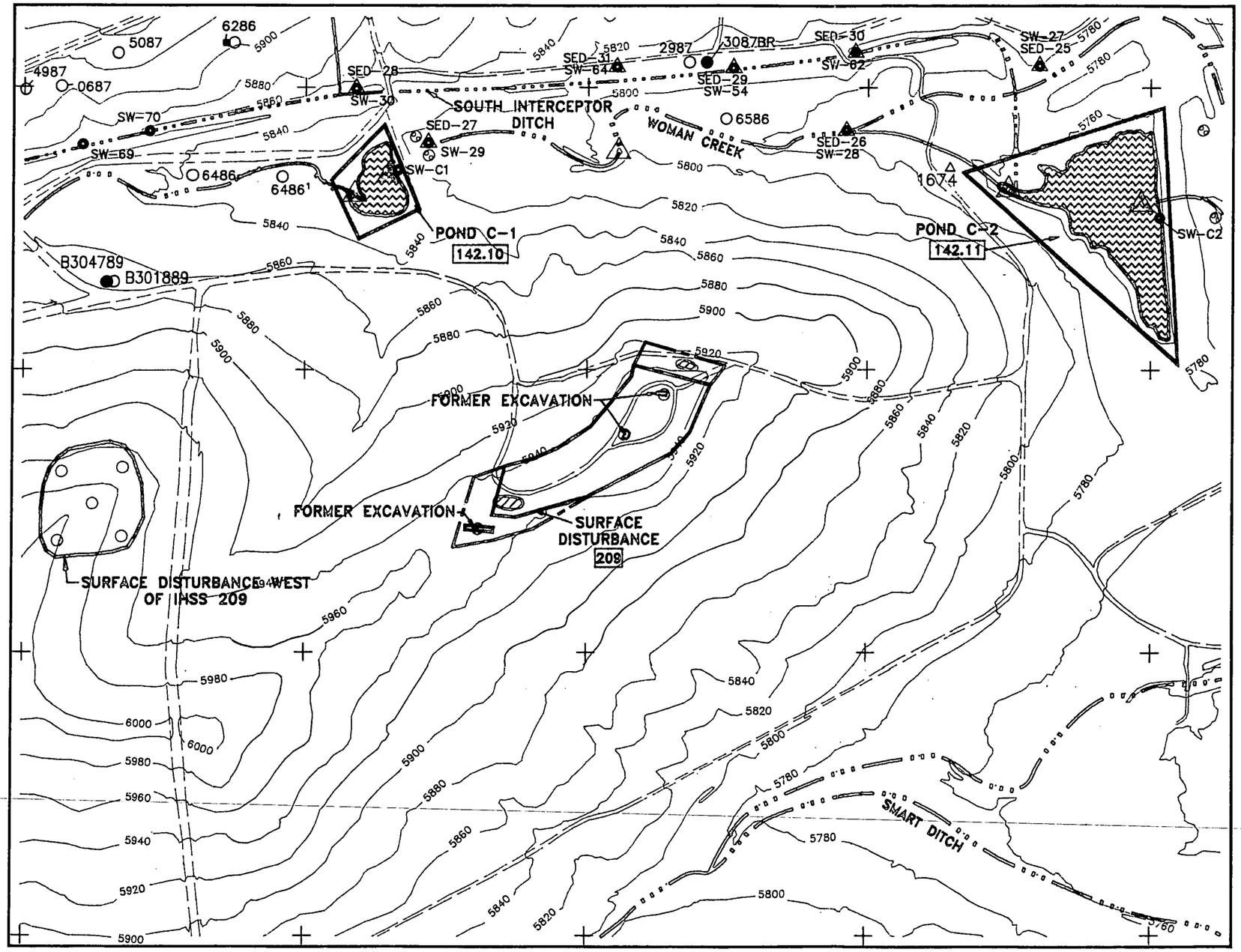
PHASE I RFI/RI WORK PLAN

PROPOSED SAMPLING & WELL LOCATIONS, ASH PITS 1-4, INCINERATOR, CONCRETE WASH PAD (IHSS 133.1-6), AND ADDITIONAL SURFACE DISTURBANCE

FIGURE 7-3

REV. FEB. 1992
MARCH 1991

R33M082.MB021392/300



N

0 200 400

SCALE: 1" = 400'

EXPLANATION

- 115 — INDIVIDUAL HAZARDOUS SUBSTANCE SITE
- SW-1 — EXISTING SURFACE WATER SAMPLING LOCATION
- 5786 — EXISTING ALLUVIAL GROUNDWATER MONITORING WELL
- SED-17 — EXISTING SEDIMENT SAMPLING LOCATION
- 3087 — EXISTING BEDROCK GROUNDWATER MONITORING WELL
- PONDLIKE DEPRESSION
- INTERMITTENT STREAM
- DIRT ROAD
- PRELIMINARY EXTENSION OF THE SURFACE DISTURBANCE BASED ON A SITE RECONNAISSANCE
- ORIGINAL STREAM CHANNEL NEAR POND C-2
- PROPOSED SOIL BORING AND SURFACE SAMPLE LOCATION *
- PROPOSED WELL LOCATION*
- PROPOSED SEDIMENT SAMPLING LOCATION **

**3 OTHER LOCATIONS IN EACH POND WILL BE SELECTED AT RANDOM

*ALL PROPOSED LOCATIONS ARE APPROXIMATE

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PROPOSED SAMPLING & WELL LOCATIONS, IHSS 142.10-11, PONDS C-1 & C-2 IHSS 209 SURFACE DISTURBANCE, & THE SURFACE DISTURBANCE WEST OF IHSS 209

FIGURE 7-4

REV. FEB. 1992
MARCH 1991

R33M083.MB021392/400